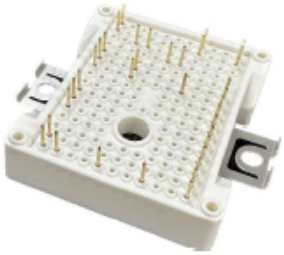
1200V/25A PIM in one-package

GM25PJ120E2T3A

FEATURES

- V_{CEsat} with positive temperature coefficient
- Low V_{CEsat}
- Low inductance case
- 10μs short circuit capability
- Isolated copper baseplate using DBC technology

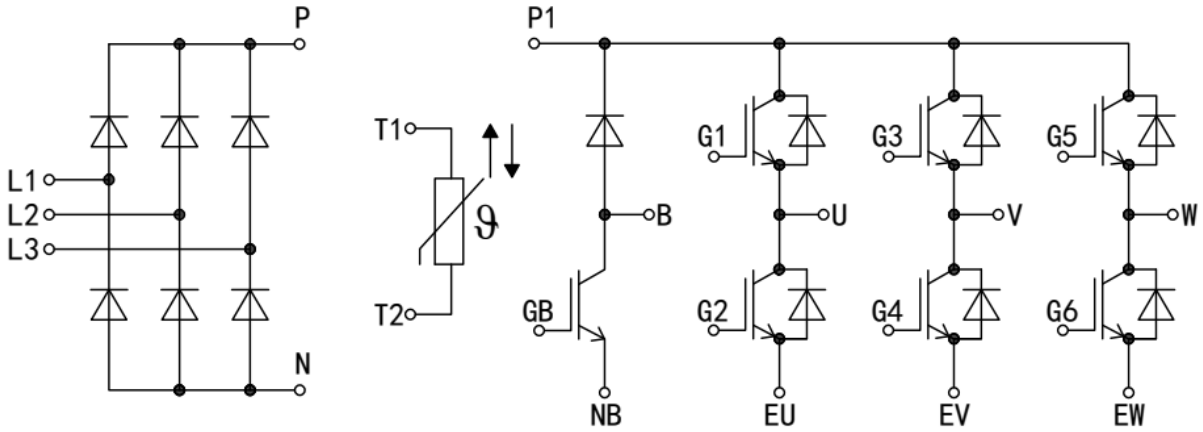
Preliminary Data
VCES = 1200V
IC nom = 25A / ICRM = 50A



APPLICATION

- Motor drivers
- Air Conditioning
- Auxiliary inverters

Equivalent Circuit Schematic



IGBT, Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25 °C	V_{CES}	1200	V
Continuous DC collector current	T_C = 100 °C, Tvj max = 175 °C T_C = 25 °C, Tvj max = 175 °C	I_C	25 50	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	50	A
Total power dissipation	TC = 25 °C, Tvj max = 175 °C	P_{tot}	192	W
Gate-emitter peak voltage		V_{GE}	±20	V

Characteristic Values

Parameter	Conditions		Symbol	Values			Units
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 25 A, V_{GE} = 15 V	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	V_{CEsat}		1.85 2.10 2.18		V
Gate threshold voltage	I_C = 0.8 mA, V_{CE} = V_{GE} Tvj = 25 °C		V_{GEth}		5.7		V
Gate charge	V_{GE} = ± 15 V		Q_G		0.255		µC
Input capacitance	f = 1 MHz, Tvj = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		3.63		nF
Reverse transfer capacitance			C_{res}		0.07		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, Tvj = 25 °C		I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25 °C		I_{GES}			400	nA
Turn-on delay time, inductive load	I_C = 25 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_G = 20 Ω,	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	$t_{d\ on}$		0.035 0.034 0.032		µs
Rise time, inductive load		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	t_r		0.034 0.036 0.035		µs
Turn-off delay time, inductive load		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	$t_{d\ off}$		0.143 0.193 0.212		µs
Fall time, inductive load		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	t_f		0.188 0.235 0.253		µs
Turn-on energy loss per pulse		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	E_{on}		1.66 2.53 2.72		mJ
Turn-off energy loss per pulse		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	E_{off}		1.36 1.80 1.88		mJ
SC data	V_{GE} ⩽ 15 V, V_{CC} = 600 V t_P ⩽ 10 µs, Tvj = 25 °C		ISC		160		A
Thermal resistance, junction to case	per IGBT		RthJC		0.78	0.88	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste}=1 W/(m·K) /λ_{grease}=1 W/(m·K)		RthCH		0.73		K/W
Temperature under switching conditions			Tvj op	-40		150	°C

Diode, Inverter
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25 °C	VRRM	1200	V
Continuous DC forward current		IF	25	A
Repetitive peak forward current	t_P = 1 ms	IFRM	50	A

Characteristic Values

Parameter	Conditions		Symbol	Values			Units
				Min.	Typ.	Max.	
Forward voltage	I_F = 25 A, V_{GE} = 0 V	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	V_F		2.21 1.92 1.84		V
Peak reverse recovery current	I_F = 25 A, - di_F/dt = 700 A/µs, V_R = 600 V, VGE = -15 V, Tvj = 25 °C	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	I_{RR}		20.6 28.6 31.6		A
Recovered charge		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	Q_{RR}		1.97 4.58 5.75		µC
Reverse recovery energy		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	E_{rec}		0.76 1.85 2.38		mJ
Thermal resistance, junction to case	per diode		R_{thJC}		1.15	1.25	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)		R_{thCH}		0.97		K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

Diode, Rectifier
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25 °C	V_{RRM}	1600	V
Maximum RMS current at rectifier output	Tc= 80 °C	I_F	25	A
Surge forward current	t_p = 10 ms, Tvj = 25 °C	I_{FSM}	320	A
I^2t - value	t_p = 10 ms, Tvj = 25 °C	I^2t	510	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	Tvj = 150 °C, I_F = 25 A	V_F		0.95		V
Reverse current	Tvj = 150 °C, V_R = 1600 V	I_R		1.00		mA
Thermal resistance, junction to case	per diode	R_{thJC}		1.05	1.15	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		0.95		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

IGBT, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25 °C	V_{CES}	1200	V
Continuous DC collector current	T_C = 100 °C, Tvj max = 175 °C T_C = 25 °C, Tvj max = 175 °C	I_C	25 50	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	50	A
Total power dissipation	TC = 25 °C, Tvj max = 175 °C	P_{tot}	192	W
Gate-emitter peak voltage		V_{CES}	±20	V

Characteristic Values

Parameter	Conditions		Symbol	Values			Units
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 25 A, V_{GE} = 15 V	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	V_{CEsat}		1.85 2.10 2.18		V
Gate threshold voltage	I_C = 0.8 mA, V_{CE} = V_{GE}, Tvj = 25 °C		V_{GEth}		5.75		V
Gate charge	V_{GE} = ±15 V		Q_G		0.255		µC
Input capacitance	f = 1 MHz, Tvj = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		3.62		nF
Reverse transfer capacitance			C_{res}		0.07		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, Tvj = 25 °C		I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25 °C		I_{GES}			400	nA
Turn-on delay time, inductive load	I_C = 25 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_G = 20 Ω,	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	$t_{d\ on}$		0.035 0.034 0.032		µs
Rise time, inductive load		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	t_r		0.034 0.036 0.035		µs
Turn-off delay time, inductive load		Tvj = 25 °C Tvj = 125°C Tvj = 150 °C	$t_{d\ off}$		0.143 0.193 0.212		µs
Fall time, inductive load		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	t_f		0.188 0.235 0.253		µs
Turn-on energy loss per pulse		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	E_{on}		1.66 2.53 2.72		mJ
Turn-off energy loss per pulse		Tvj = 25°C Tvj = 125°C Tvj = 150°C	E_{off}		1.36 1.80 1.88		mJ
SC data	V_{GE} ⩽ 15 V, V_{CC} = 800 V t_P ⩽ 10 µs, Tvj = 25 °C		ISC		160		A
Thermal resistance, junction to case	per IGBT		RthJC		0.78	0.88	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste}=1 W/(m·K) /λ_{grease}=1 W/(m·K)		RthCH		0.73		K/W
Temperature under switching conditions			Tvj op	-40		150	°C

Diode, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25 °C	VRRM	1200	V
Continuous DC forward current		IF	10	A
Repetitive peak forward current	t_P = 1 ms	IFRM	20	A

Characteristic Values

Parameter	Conditions		Symbol	Values			Units
				Min.	Typ.	Max.	
Forward voltage	I_F = 10 A, V_{GE} = 0 V	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	V_F		1.64 1.31 1.23		V
Peak reverse recovery current	I_F = 10 A, - di_F/dt = 800 A/µs, V_R = 600 V, VGE = -15 V , Tvj = 25 °C	Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	I_{RR}		16.6 20.6 21.4		A
Recovered charge		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	Q_{RR}		1.10 1.94 2.17		µC
Reverse recovery energy		Tvj = 25 °C Tvj = 125 °C Tvj = 150 °C	E_{rec}		0.41 0.53 0.85		mJ
Thermal resistance, junction to case	per diode		R_{thJC}		1.24		K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)		R_{thCH}		1.2		K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

NTC-Thermistor
Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Rated resistance	T_{NTC} = 25 °C	R_{25}		5		kΩ
Deviation of R100	T_{NTC} = 100 °C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Power dissipation	T_{NTC} = 25 °C	P_{25}			20	mW

Module

Maximum Rated Values

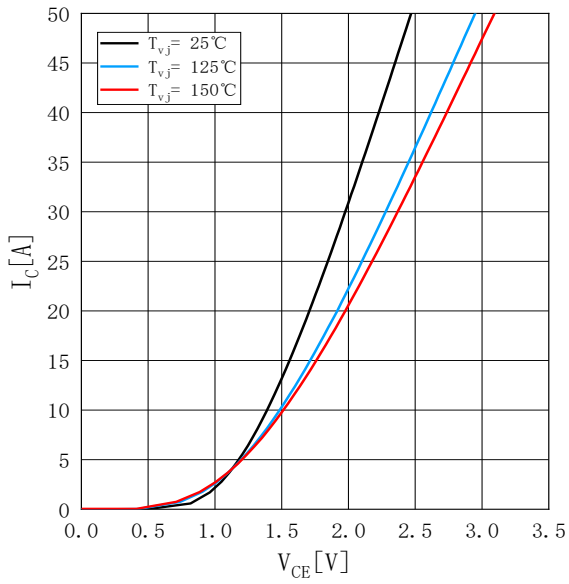
Parameter	Conditions	Symbol	Values	Units
Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	VISOL	2.5	kV
Internal isolation	basic insulation (class 1, IEC 61140)		AI_2O_3	
Creepage distance	terminal to heatsink terminal to terminal		11.5 6.3	mm
Clearance	terminal to heatsink terminal to terminal		10.0 5.0	mm
Comperative tracking index		CTI	＞200	

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Stray inductance module and fixture		L_{sCE}		30		nH
Module lead resistance, terminals - chip	TC = 25 °C, per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		5 6		mΩ
Storage temperature		T_{stg}	-40		125	°C
Mountig force per clamp		F	40		80	N
Weight		G		40		g

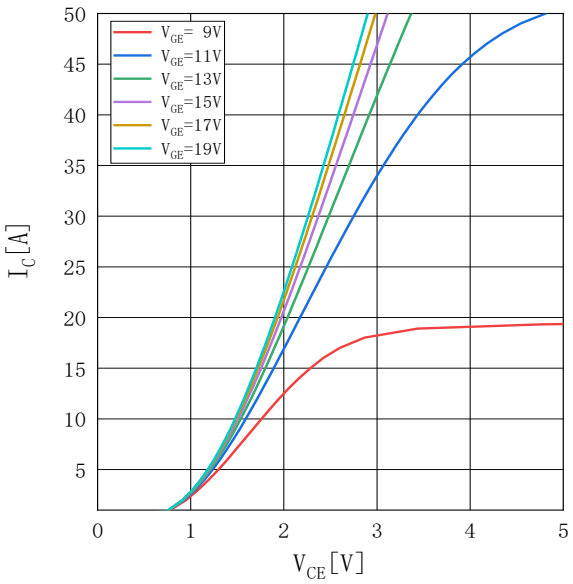
Outputcharacteristic IGBT,Inverter (typical)

$I_C=f(V_{CE})$
$V_{GE}=15V$



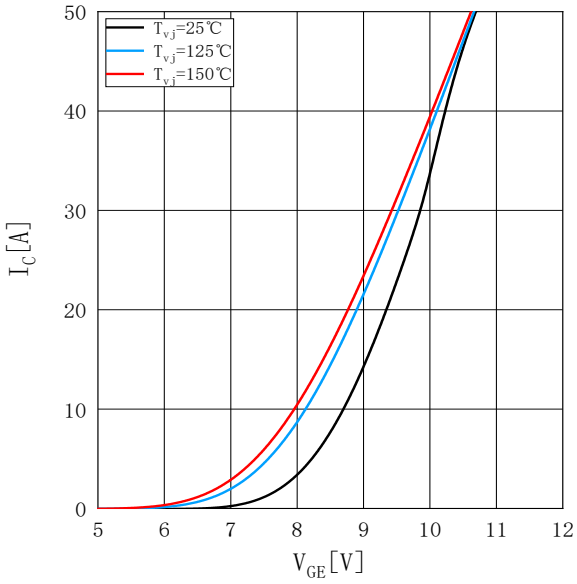
Outputcharacteristic IGBT,Inverter (typical)

$I_C=f(V_{CE})$
$T_{vj}=150°C$



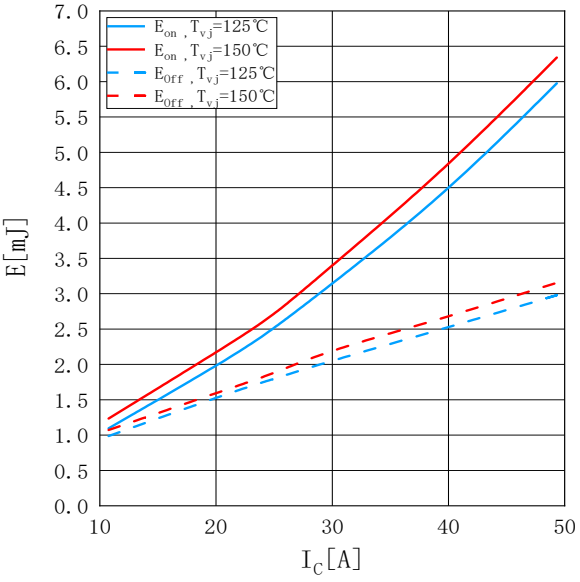
TansfercharacteristicIGBT,Inverter (typical)

$I_C=f(V_{GE})$
$V_{CE}=20V$



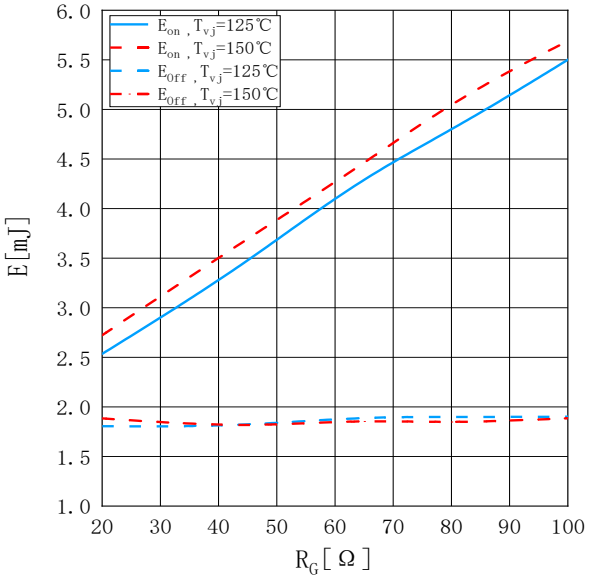
Switching losses IGBT , Inverter (typical)

$E_{on}=f(I_C)$, $E_{off}=f(I_C)$
$V_{GE}=\pm15V, R_{Gon}=20\Omega, R_{Goff}=20\Omega, V_{CE}=600V$



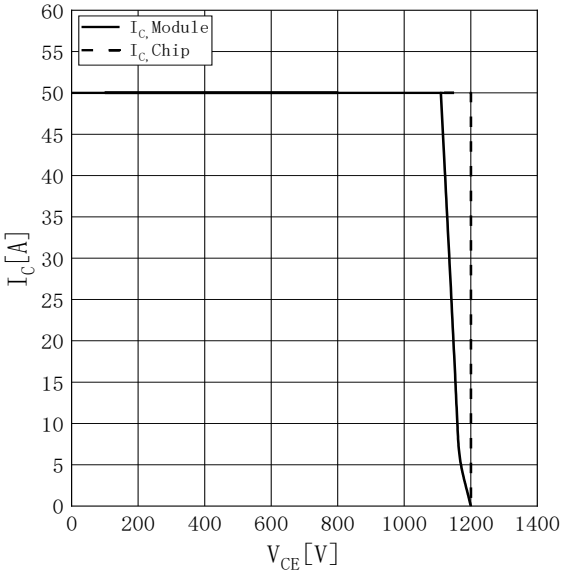
Switching losses IGBT , Inverter (typical)

$E_{on}=f(R_G)$, $E_{off}=f(R_G)$
$V_{GE}=\pm15V, I_C=25A, V_{CE}=600V$



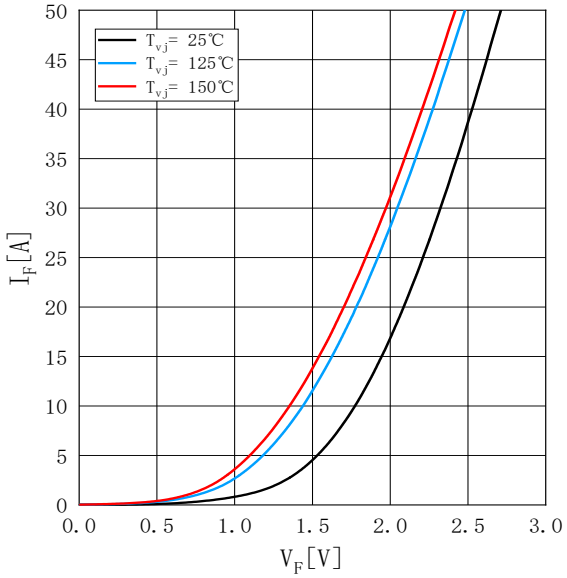
ReversebiassafeoperatingareaIGBT,Inverter (RBSOA)

$I_C=f(V_{CE})$,
$V_{GE}=\pm15V, R_{Goff}=20\Omega, T_{vj}=150℃$



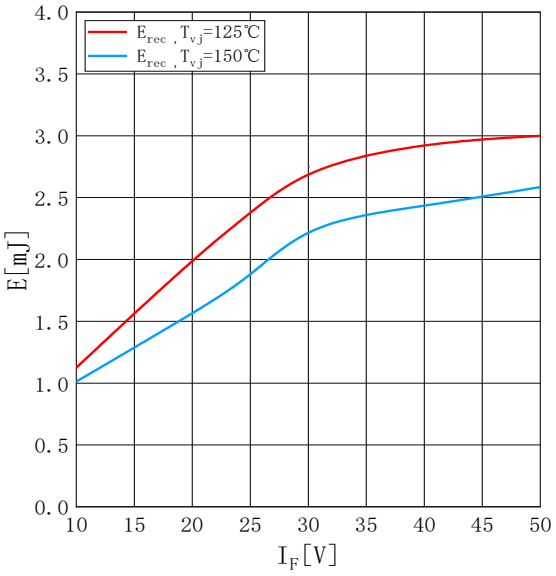
Forward characteristicofDiode,Inverter (typical)

$I_F=f(V_F)$



Switching lossesDiode,Inverter (typical)

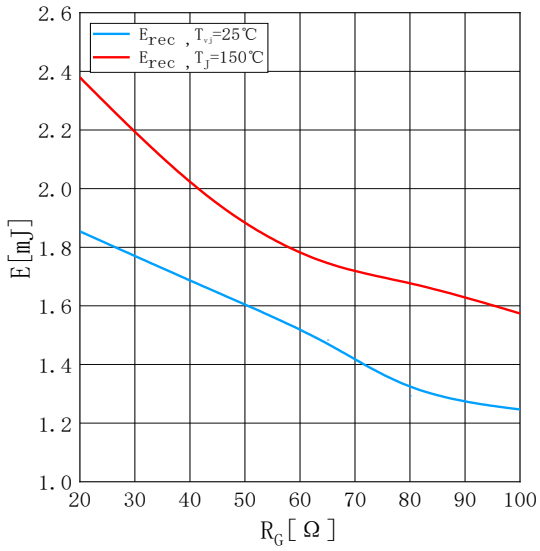
$E_{rec}=f(I_F)$
$R_{Gon}=20\Omega, V_{CE}=600V$



Switching lossesDiode,Inverter (typical)

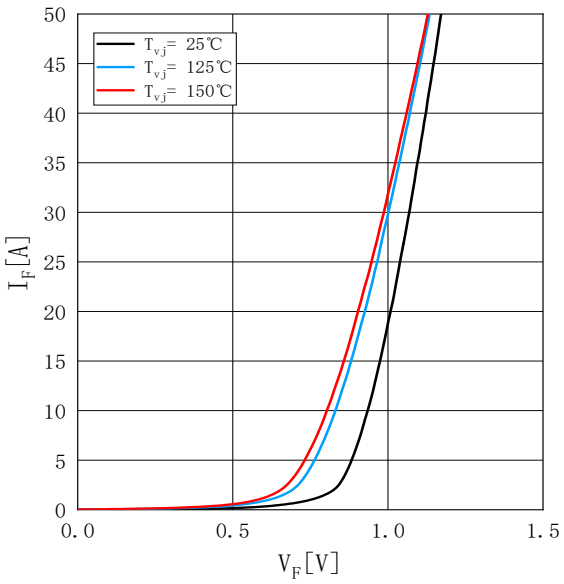
$E_{rec}=f(R_G)$

$I_F=25A, V_{CE}=600V$



Forward characteristic of Diode,Rectifier

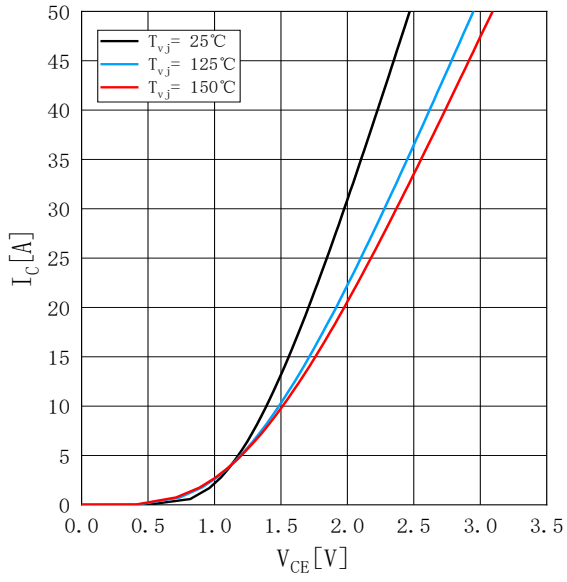
$I_F=f(V_F)$



Output characteristic IGBT,Brake-Chopper (typical)

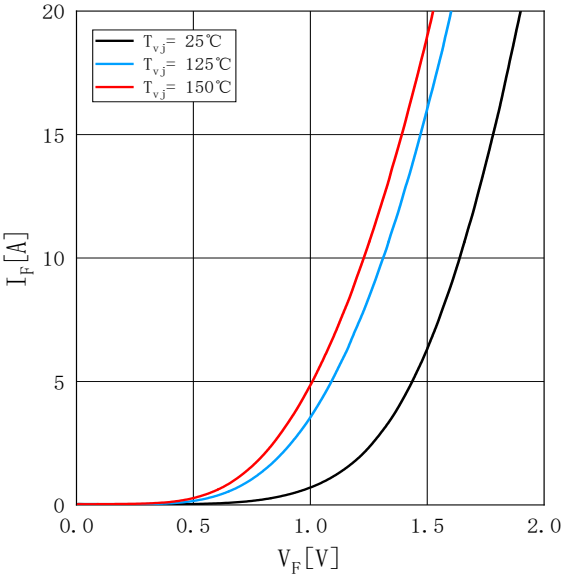
$I_C=f(V_{CE})$

$V_{GE}=15V$



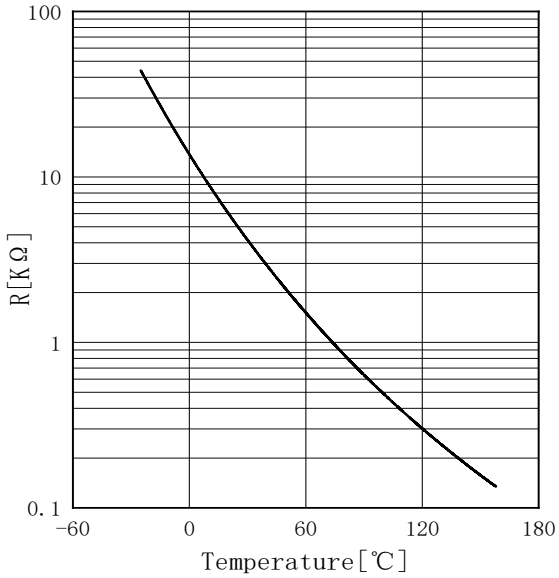
Forward characteristic of Diode, Brake-Chopper(typical)

$I_F=f(V_F)$

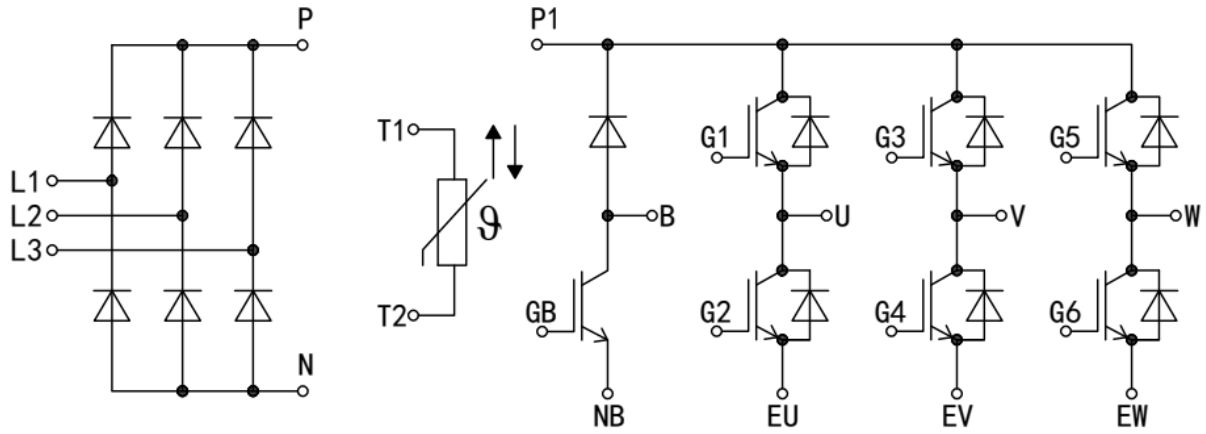


NTC Temperature characteristic (typical)

R=f(T)



Circuit diagram



Package outlines (mm)